

RATIONALE SHEET
STATE OF TENNESSEE NPDES GENERAL PERMIT
FOR WASTEWATER DISCHARGES ASSOCIATED
WITH WATER TREATMENT PLANTS
Permit Number TNG640000

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I. PURPOSE AND BACKGROUND

A. Purpose of Rationale Sheet

This rationale or fact sheet is a document that provides the technical, regulatory and administrative basis for the Tennessee Department of Environment and Conservation, Division of Water Pollution Control (division) permitting decision for drafting the Discharges for Filter Backwash and Sedimentation Basin washwater from Water Treatment Plant General NPDES Permit. It explains the basis for conditions of the general NPDES permit to cover discharges from water treatment plants in all areas in the state of Tennessee. This permit covers any new or existing discharges of filter backwash and/or sedimentation basin washwater from water treatment plants.

The state proposes to issue an NPDES general permit for water treatment plants as the means to authorize discharges from water treatment plants. A general permit is one designed to allow the holder thereof to conduct activities listed in Tennessee Water Quality Control Act (TWQCA) Tennessee Code Annotated Section 69-3-108 only after strict compliance with conditions and applicable effluent limitations. Section 69-3-108(a), (b) and (c) of the TWQCA explicitly states when a permit is required, and what activities shall be unlawful without a permit.

A general permit applies to a category of sources that involve the same type of wastes, and requires the same or similar permit conditions and monitoring provisions. There are two categories of water treatment plants: turbidity removal plants and iron removal plants. Within these two categories the plants processes involve the same types of operations, discharge waste, permit conditions, effluent limitations and monitoring requirements. The division acknowledges that water treatment plants meet federal and state regulations requirements to be covered under a general NPDES permit to better control the sources of pollutants and protect the waters of the state.

This proposed general permit is to be effective for a term of five years.

B. Number of Water Treatment Plants (WTPs) in Tennessee

There are 111 regulated WTPs that are covered by an NPDES permit to discharge wastewater to waters of the state in Tennessee.

II. AUTHORIZATION TO DISCHARGE UNDER THIS PERMIT

To obtain authorization to discharge under this permit, a facility must submit a complete notice of intent (NOI) to the division. The division may grant or deny coverage under this permit, or require an application for an individual permit. The division will review the NOI for completeness and accuracy and will specify the effective dates of the permit in transmitting permit material to the permittees.

III. PRESENT PERMIT LIMITS

The division issued the current NPDES General Permit Number TNG640000 on June 30, 1999. The general permit expires on June 30, 2004. In addition, in cases where the receiving stream is water quality limited, the general permit sets forth a calculation procedure whereby a water quality limit is applied to

the discharge in accordance with the State of Tennessee Water Quality Standards. The effluent characteristics and corresponding limits from the current general permit are listed in the table below:

<i>Effluent Characteristic</i>	<i>Daily Max. Conc. (mg/l)</i>	<i>Sample Type</i>	<i>Monitoring Frequency</i>
Flow	Report Flow Rate	Instantaneous	Monthly
Total Suspended Solids (TSS)	40	Grab	Monthly
Settleable Solids	0.5 (mL/L)	Grab	Monthly
pH	6.5 – 9.0	Grab	Monthly
Aluminum (total)	10*	Grab	Monthly
Iron (total)	10*	Grab	Monthly
Chlorine (total residual)	1.0*	Grab	Monthly

*These technology-based limits are compared to water-quality based limits protective of receiving stream designated uses which are applied if and when more restrictive than the technology-based limits.

IV. METHODOLOGY FOR DEVELOPMENT OF EFFLUENT LIMITATIONS

A. Technology-Based Effluent Limitations

Federal and state laws require that a discharge permit must establish effluent limitations equivalent to the best practicable control technology currently available and the best available technology economically achievable for existing sources. Under state and federal laws and regulations discharge permits must also establish the greatest degree of effluent reduction achievable through the best available demonstrated control technology as a new source performance standard for new sources.

B. Narrative Effluent Limitations

A discharge permit must establish best management practices to control or abate the discharge of pollutants when numeric effluent limitations are infeasible and the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purpose and intent of TWQCA.

C. Water Quality-Based Effluent Limitations

The effluent limitations, standards, or conditions of a permit must be at least as stringent as the effluent limitations, standards, or conditions in the previous permit in order to achieve water quality standards or to control all pollutants which may be discharged into waters of the state that have reasonable potential to cause or contribute to the degradation of the water body.

The division proposes water quality-based limitations for aluminum, iron and total residual chlorine to protect relatively small streams that receive the backwash or sedimentation basin washout from water treatment plants.

V. RATIONALE FOR PROPOSED EFFLUENT LIMITATIONS

A. Pollutant Limitations and Standard Technology

Water treatment plants are those facilities that treat water, ground water or surface water, and produce potable water for “domestic uses” or provide primary treatment and produce "industrial water." WTPs withdraw water from rivers, lakes, springs or creeks. WTPs also pump water from underground aquifers.

The treatment processes include coagulation, flocculation, sedimentation and filtration to remove suspended solids (SS), iron and other pollutants from the water intake. Aluminum sulfate is an agent used to destabilize the state of suspended solids in the treatment processes. Chlorine is used in the final treatment processes to disinfect the water before distribution. Iron removal plants use filtration processes (bedrock or sand) to remove iron from ground water. Iron, aluminum and chlorine used in the water treatment processes are pollutants and have reasonable potential to cause or contribute to degradation of the receiving stream.

Discussed below is the division's rationale for effluent limitations. The best performance-base technology for aluminum, iron and chlorine and the best treatability-technology for total suspended solids, settleable solids and pH-based limitations are presented.

In determining technology-based limits, the division reviewed the discharge monitoring reports (DMRs) from permitted Tennessee WTPs covered under the previous NPDES general permit. Data from 110 different sites in a time frame of ten years (February 1, 1994, to February 1, 2004) was reviewed. Information included in the data summary below includes number of data samples, an average value, standard deviation (σ) median value, and a percentage of plants that met the technology-based criteria for regulated plants (this percentage does not include water treatment plants not regulated by the general permit). Median is a statistical term identifying a number that divides numerically ordered data into two equal halves. In easier terms, the median is the middle data point when all collected data are placed in numerical order, or the average of the middle two if there is an even number data points. In order to present the most conservative data analysis, any value reported as “less than” was considered to be present at the reported method detection level for statistical purposes (e.g. <0.005 was regarded as 0.005 mg/L).

B. Proposed Effluent Limitations

Total Suspended Solids (TSS) and Settleable Solids

The State of Tennessee General Water Quality Criteria for domestic and industrial water uses, fish and aquatic uses, recreation, irrigation, livestock watering and wildlife and navigation states: there shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottoms deposits or sludge banks of such size or character as may impair the usefulness of the water as a source of domestic and industrial water supply; that may be detrimental to fish and aquatic life and as to interfere with recreation, irrigation, livestock watering and wildlife and navigation. The division proposes to retain the previous technology-based permit limit for TSS, which was based on the Tennessee Rule 1200-4-5-.03(2), “Effluent Limitations for Effluent Limited Segments” of

40 mg/L

as a daily maximum concentration for TSS. The division believes this limit is achievable by WTPs and protective of designated uses of receiving streams.

Out of 1994 samples reported on DMRs, an average value for TSS was 9.0 mg/L (with a standard deviation $\sigma = 27$), and the median value was 4.8 mg/L. Of all the data points collected, 91% of the data collected from DMRs were less than 40 mg/L.

In accordance with the Tennessee Rule 1200-4-5-.03(2) the concentration of settleable solids shall not exceed 0.5 mL/L as measured by the standard one-hour Imhoff cone test. The division proposes to retain the previous permit limit for settleable solids of

0.5 mL/L

as a maximum limit for settleable solids. The division believes this limit is achievable by WTPs and protective of designated uses of receiving streams.

Out of 662 samples reported on DMRs, an average value for settleable solids was 0.83 mL/L (with a standard deviation $\sigma = 4.13$), and the median value was 0.1 mL/L. Of all the data collected, 89% meet the 0.5 mL/L limit.

pH

The Tennessee Rule 1200-4-5-.03(2), “Effluent Limitations for Effluent Limited Segments,” establishes technology-based limits for pH within the range of 6.0 to 9.0. According to the State of Tennessee Water Quality Standards [Chapter 1200-4-3-.03(3) (b)], the pH for the protection of fish and aquatic life shall lie within the range of 6.5 to 9.0 and shall not fluctuate more than 1.0 unit in this range over a period of 24-hours. This limit also applies to discharges into 7Q10 zero low flow streams. The water quality limit will be retained in this permit. The division believes that the water quality limit of 6.5 to 9.0 for pH is achievable by WTPs and protective of designated uses of receiving streams.

Out of 1761 samples reported on DMRs, 1% was above the pH limit of 9.0 and 1% of the samples were below the previous permit pH limit of 6.5. Of all the data collected, 98% were within the previous permit limits.

Aluminum, total

Aluminum is used in WTPs as a coagulating or a flocculating agent. A performance-based effluent limit of 10.0 mg/L was used in the previous permit as a technology-base limit and is retained in this permit. The Environmental Protection Agency (EPA) criteria document (August 1988) gives an instream criterion continuous concentration (CCC) of 0.087 mg/L and an instream criterion maximum concentration (CMC) of 0.75 mg/L with an associated pH range of 6.5 – 9.0. Based on the intermittent nature of WTP operation and discharge, the CMC-based (acute) calculated limitation for total aluminum is applicable for protection of water quality. The calculated limitation will be based on the mass-balance equation as described below.

In determining the water quality-based limits the division proposes to use the following mass balance equation assuming that the discharges of any one of the given parameters are completely mixed in the stream:

$$C_m = \frac{C_s Q_s + C_w Q_w}{Q_s + Q_w}$$

where:

C_m = the resultant in stream concentration of the pollutant

C_s = the background concentration of the pollutant in the stream

Q_s = the flow of the stream, the 7-day, 10 year low flow of the stream

C_w = the concentration of the pollutant in the wastewater discharge

Q_w = the flow of the discharge into the stream

If C_m is higher than the water quality standard for a parameter, then a lower, water quality-based limit (C_w) is required. The mass balance equation is used to determine C_w which is as follows:

$$C_w = \frac{C_m(Q_s + Q_w) - C_s Q_s}{Q_w}$$

If background concentration is assumed to be $C_s = 0$, then the mass balance equation would become:

$$C_w = \frac{C_m Q_s + C_m Q_w}{Q_w}$$

The division proposes to include the above procedure in order to protect designated uses of streams. Therefore, the limitation for total aluminum will be:

$$\text{the lower of either } 10 \text{ mg/L} \quad \text{or} \quad 0.75 + \frac{(0.75 \times Q_s)}{Q_w} \text{ mg/L}$$

as a daily maximum limit.

Q_s refers to the 7-day, 10-year low flow (7Q10, or 1Q10 for regulated streams) of the stream into which backwash and washwaters are discharged. Q_w refers to the discharge flow of backwash and washwater. This limit applies to wastewater discharges from plants that use an aluminum-based coagulant.

Out of 2609 samples reported on DMRs, an average value for aluminum was 1.6 mg/L (with a standard deviation $\sigma = 23$), and the median value was 0.34 mg/L. Of the data sampled 99% meet the technology-based limit of 10.0 mg/L. This analysis did not evaluate compliance with the various calculated water quality-based aluminum limits.

Iron, total

Based on the Tennessee Rule 1200-4-5-.03(2), "Effluent Limitations for Effluent Limited Segments", the previous general permit established a technology-based limit for iron of 10.0 mg/L. The EPA criteria document (August 1988) gives an instream criterion continuous concentration (CCC) of 1.0 mg/L. Based on the intermittent nature of WTP operation and discharge, the CMC-based calculated limitation for total iron is applicable for protection of water quality. In the absence of criterion maximum concentration

(CMC), it is the division's policy to use twice the CCC value (2.0 mg/L) for establishing daily maximum water quality-based effluent limitations in NPDES permits. Therefore, using the above described procedure to protect designated uses of streams the limitation for total iron will be:

the lower of either 10 mg/L or $2.0 + \frac{(2.0 \times Q_s)}{Q_w}$ mg/L
as a daily maximum limit.

Qs refers to the 7-day, 10-year low flow (7Q10, or 1Q10 for regulated streams) of the stream into which backwash and washwaters are discharged. Qw refers to the discharge flow of backwash and washwater. This limit applies to wastewater discharges from iron removal water treatment plants.

Of the 642 samples reported on DMRs, an average value for iron was 1.5 mg/l (with a standard deviation $\sigma = 9$), and the median value was 0.52 mg/l. Of the data sampled over 90% meet the technology-base limit. This analysis did not evaluate compliance with the various calculated water quality-base iron limits.

Total residual chlorine (TRC)

Based on the Tennessee Rule 1200-4-5-.03(2), "Effluent Limitations for Effluent Limited Segments," the previous general permit established a technology-based limit of 1.0 mg/L for TRC. This limit must be compared to the State of Tennessee Water Quality Standards for the protection of fish & aquatic life [1200-4-3.03] of 0.019 mg/L. The instream CCC for TRC is 0.011 mg/L. Based on the intermittent nature of WTP operation and discharge, the CMC-based calculated limitation for TRC is applicable for protection of water quality. The CMC-based calculated limitation for TRC is 0.019 mg/L.

Therefore, using the above described procedure to protect designated uses of streams a limitation for total TRC will be:

the lower of either 1.0 mg/L or $0.019 + \frac{(0.019 \times Q_s)}{Q_w}$ mg/L
as a daily maximum limit.

Qs refers to the 7-day, 10-year low flow (7Q10, or 1Q10 for regulated streams) of the stream into which backwash and washwaters are discharged. Qw refers to the discharge flow of backwash and washwater.

Out of 1180 samples reported on DMRs, an average value for total residual chlorine was 0.27 mg/L (with a standard deviation $\sigma = 1.2$), and the median value was 0.11 mg/L. 96% of the data reported meet the technology-based criteria of 1.0 mg/l. This analysis did not evaluate compliance with the various calculated water quality-base iron limits.

C. Monitoring Requirements

Monitoring frequency for all parameters shall be once per month.

D. Sampling Requirements

Samples and measurements shall be representative of the volume and nature of the discharge wastewater.

E. Reporting Requirements

Monitoring results shall be recorded monthly and reported quarterly using DMR forms supplied by the division.

F. Other Conditions

Permittees will be required to post a sign at the outfall that serves to notify the public of the nature of the discharge and that the discharge is regulated by the division.

Numerous standard NPDES permit conditions will be incorporated in the general permit, as required by EPA regulations. Standard requirements regard duty to comply, renotification, proper operation and maintenance, signatory requirements, etc.

VI. NOTIFICATION REQUIREMENTS

A. Notice of Intent (NOI) Requirements

Facilities who are requesting coverage under this general permit must submit a Notice of Intent (NOI) to be covered under this general permit. A standard NOI form is provided in Appendix A of this general permit.

B. Schedule for Permit Issuance

Following are dates associated with this general permit issuance process:

Public Notices: March 8, 2004 and April 5, 2004;
Target Issuance Date: June 30, 2004.

C. Consideration of Comments and Permit Issuance Decisions

The division proposes to issue this permit with the described effluent limitations, monitoring and reporting requirements and standard conditions. These conditions are tentative and open to comment. Interested persons are invited to submit comments for consideration, by letter or at the scheduled public hearing.

A public hearing is scheduled for April 27, 2004 at 5:00 (CDT), at the following address:

**Tennessee Department of Environment and Conservation
Division of Water Pollution Control
Permit Section
401 Church Street
L & C Tower, 17th Floor Conference Room
Nashville, TN 37243**

All comments must be received by May 30, 2004.

Comments should be submitted to the following address:

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
Attn: La Verne Swift
6th Floor, L&C Annex
401 Church Street
Nashville, TN 37243-1534
email: Laverne.Swift@state.tn.us

VIII. ANTIDegradation

Tennessee's Antidegradation Statement is found in the Rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3-.06. This statement outlines the criteria for the two types of high quality waters. Outstanding National Resource Waters (ONRWs), as designated by the Water Quality Control Board, are commonly referred to as Tier 3 waters. Other high quality waters, as identified by the division, are commonly referred to as Tier 2 waters. Other surface waters not specifically identified and/or designated as high quality are referred to as Tier 1 waters. Some Tier 1 waters may be identified by the division as not meeting existing criteria and appear on a list of impaired waters per Section 303(d) of the CWA.

The division must make a stream tier determination of the receiving waters associated with the water treatment plants discharge(s) and find the receiving streams to be neither a Tier 2 nor Tier 3 water. Discharges to Tier 3 waters are prohibited. Discharges to Tier 2 waters may not be covered under this permit. In those cases, the applicant must apply for an individual permit in accordance with part X(K) of the permit. The division has maintained, and shall continue to assess, the water quality of the streams to assure that the water quality is adequate to protect the existing uses of the stream fully, and to assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for non-point source control.

Impaired waters means any segment of surface waters that has been identified by the division as failing to support classified uses and appear on a list of impacted waters per Section 303(d) of the CWA. The division cannot authorize the discharge of pollutants in such a manner as to cause or contribute to a violation of any water quality standards. Pollutants of concern associated with discharges from WTPs are iron, pH, chlorine, aluminum, total suspended solids and settleable solids. Any new source or existing source that proposes to increase pollutant loadings into receiving streams impaired by pollutants of concern may not be authorized under this permit. Existing discharges may be allowed at current loadings.

Of the 111 WTPs in Tennessee only one receiving stream segment was found to be impaired and partially supporting designated uses. Ranger Creek is an impaired stream for iron and pH due to abandoned mining. Big Creek WTP discharges into Ranger Creek with stream segment identification number TN05130107016-0710 located in Grundy County. Big Creek WTP is a conventional iron and manganese removal plant that uses oxidation as a treatment process. In an effort to effectively minimize further degradation to Ranger Creek any future increase in loading is prohibited for Big Creek WTP. If the director or division determines that pollutants from Big Creek WTP discharge could possibly contribute to a violation of the Water Quality Control Act an individual permit must be obtained in accordance with part X.L. of this permit.

VIII. PERMIT DURATION

The proposed limitations meet the requirements of Section 301(b)(2)(A), (C), (D), (E), and (F) of the CWA as amended. It is the intent of the division to organize the future issuance and expiration of this particular permit such that other permits located in the same group within the state of Tennessee will be set for issuance and expiration at the same time. In order to meet the target reissuance date for the permit and following the directives for the Watershed Management Program initiated in January 1996, the permit will be issued to expire in 2009.